gave a NEP of 3×10^{-19} watt/Hz at 30 MHz for a receiver using a Ge:Hg mixer element. This value compared favorably to the NEP of 1.6×10^{-19} watt/Hz at 1 KHz for the same mixer element.

The packaged receiver, consisting of a mixer-amplifier package and a remote-control package will be described. Measured data on sensitivity, frequency response, available mixer gain, variation of NEP with local oscillator power and dc bias, etc., will be reported and discussed.

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10.4 CW METAL VAPOR ION LASERS, W. T. Silfvast, Bell Telephone Laboratories, Holmdel, N. J.

The 4416Å transition in CdII was the first metal vapor system to exhibit CW laser action. The system appears to be one of the most simple and efficient lasers operating in the visible region of the spectrum. At the present time, peak powers of 100 mW and gains as high as 35% per meter have been observed along with relatively high efficiencies. The laser has been successfully operated without the use of an externally controlled furnace by thermally insulating the discharge region and using the discharge current to heat the metal to the necessary vapor pressure.

The excitation mechanism is believed to be a Penning ionization in the form of a He metastable colliding with a neutral metal atom and exciting it to the upper laser level of the ion. The excess energy is taken up by the ejected electron. This mechanism can be applied to other metal vapor systems and several new CW laser transitions will be discussed.

10.5 HIGH-POWER CW ULTRAVIOLET ION LASERS, W. B. Bridges, A. S. Halsted and G. N. Mercer, Hughes Research Laboratories, Malibu, Calif.

Over 1 watt of continuous ultraviolet output has been obtained from an argon ion laser in the 3500-3700Å range. This paper describes the discharge tube structure used and the operating characteristics of high-power ultraviolet laser transitions in argon and other noble gas ions. Operation at new wavelengths as well as CW operation of transitions previously observed only in pulsed operation are reported. Measurements of the dependence of spontaneous emission intensity from different ionization states on current and pressure are related to the excitation mechanisms for visible and uv ion lasers. The technique of population modulation by intracavity interruption has been used to study processes in the throat and uniform bore regions of ion laser discharges. The results of these studies are described. Problems encountered in the CW operation of ion laser discharge tubes at current densities above 1000Å/cm^2 are described.